Math 121 - Calculus & Analytic Geometry I
Summer 2009 Course Syllabus

James Jones, Professor of Mathematics
Mathematics & Sciences Division
Richland Community College

Course Meeting Information

Section 01 meets from 10:00 am to 12:15 pm on Mon, Tue, Wed, and Thu in room S137.

Instructor Information

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Office Hours

Office hours are not required of faculty during the summer term. If you need help please email the instructor or see him before or after class.

Texts

Calculus: Late Transcendentals Single and Multivariable, 8th edition. Howard Anton, Irl Bivens, Stephen Davis. Copyright 2005, John Wiley & Sons, Inc. ISBN 0-471-48273-0 (Required)
Student Solutions Manual to accompany Calculus Late Transcendentals Single Variable, Eighth Edition. Neil Wrigley. Copyright 2005, John Wiley & Sons, Inc. ISBN 0-471-67210-6 (Optional)

Student Audience

Transfer students. Students pursuing degrees in engineering, mathematics, computer science, natural sciences, and life sciences.

Prerequisite

Successful completion (C or better grade) of Math 116, College Algebra, and Math 117, Trigonometry, or satisfactory score on the Mathematics placement exam.

Course Description

MATH 121 - Calculus & Analytic Geometry I
Hours: 5 lecture - 0 lab - 5 credit
Mathematics 121, Calculus and Analytic Geometry I, includes instruction in Calculus topics common to the standard college first semester Calculus course. It begins with a review of algebra and trigonometry; then the idea of limits and continuity is introduced. With the knowledge of limits and continuity the student develops the concept of the derivative and its applications. At the end, the student studies the antiderivative of elementary functions and the applications of the definite integral in geometry, science, and engineering.
Applicable toward graduation where program structure permits.
- Certificate or degree: All certificates and all degrees.
- Group requirement: Mathematics

- Area of Concentration: Mathematics.

Illinois Articulation Initiative (IAI)

The mathematics component of general education focuses on quantitative reasoning to provide a base for developing a quantitatively literate college graduate. Every college graduate should be able to apply simple mathematical methods to the solution of real-world problems. A quantitatively literate college graduate should be able to:
- interpret mathematical models such as formulas, graphs, tables, and schematics, and draw inferences from them;
- represent mathematical information symbolically, visually, numerically, and verbally;
- use arithmetic, algebraic, geometric, and statistical methods to solve problems;
- estimate and check answers to mathematical problems in order to determine reasonableness, identify alternatives, and select optimal results; and
- recognize the limitations of mathematical and statistical models.

Courses accepted in fulfilling the general education mathematics requirement emphasize the development of the student's capability to do mathematical reasoning and problem solving in settings the college graduate may encounter in the future. General education mathematics courses should not lead simply to an appreciation of the place of mathematics in society, nor should they be merely mechanical or computational in character.

To accomplish this purpose, students should have at least one course at the lower-division level that emphasizes the foundations of quantitative literacy and, preferably, a second course that solidifies and deepens this foundation to enable the student to internalize these habits of thought.

Math 121, Calculus & Analytic Geometry I, satisfies the Illinois Articulation Initiative Definition of a General Education Mathematics Course. It corresponds to M1 900-1, College-level Calculus I.

M1 900-1: College-level Calculus I (4-5 semester credits)
Topics include (but are not limited to) the following: limits and continuity; definition of derivative: rate of change, slope; derivatives of polynomial and rational functions; the chain rule; implicit differentials; approximation by differentials; higher order derivatives; Rolle's Theorem: mean value theorem; applications of the derivative; anti-derivative; the definite integral; the fundamental theorem of calculus; area, volume, other applications of the integral; the calculus of the trigonometric functions; logarithmic and exponential functions; techniques of integration, including numerical methods; indeterminate forms: L'Hôpital's rule; improper integrals; sequences and series, convergence tests, Taylor series; functions of more than one variable, partial derivatives; the differential, directional derivatives, gradients; double and triple integrals: evaluation and applications. Prerequisite for Calculus I: College Algebra and Trigonometry with grades of C or better or Elementary Functions with a grade of C or better.

For more information on the Illinois Articulation Initiative, visit their website at
http://www.itransfer.org/

General Course Objectives

While learning calculus is certainly one of the goals of this course, it is not the only objective. Upon completion of this course, the student should be able to ...

- demonstrate comprehension and understanding in the topics of the course through symbolic, numeric, and graphic methods
- demonstrate the use of proper mathematical notation
- use technology when appropriate and know the limitations of technology
- work with others towards the completion of a common goal
- use deductive reasoning and critical thinking to solve problems

Specific Course Objectives
Upon completion of this course, the student should be able to ...
- find the limits of expressions involving algebraic and trigonometric functions
- determine where functions are continuous and classify discontinuities as removable or non-removable
- find the derivative of a function using the limit definition
- apply the basic rules of differentiation to find the derivatives of algebraic and trigonometric functions
- find higher order derivatives
- use implicit differentiation
- analyze the graph of a function using the first and second derivative
- use the derivative to solve applied problems involving maximums and minimums
- find the antiderivative of algebraic and trigonometric functions
- understand the relationship between Riemann sums and definite integrals
- apply the fundamental theorem of calculus to evaluate definite integrals
- find the area under a curve and between two curves
- find volumes of rotation, lengths of planar curves, and surface areas of revolution
- work application problems from physics including work, force, and pressure

Type of Instruction
Discussion, problem solving, student questions, student participation, oral presentations, and lecture. Students are expected to read the material before coming to class and are strongly encouraged to come to class with a list of questions and to ask these questions.

Method of Evaluation
Could include any of the following: problem solving exams, objective exams, essays, research papers, oral presentations, group projects, quizzes, homework.

Grading Policy
Letter grades will be assigned to final adjusted scores as follows:
- A: 90 - 100%
- B: 80 - 89%
- C: 70 - 79%
- D: 60 - 69%
- F: below 60%

Consideration may be given to such qualities as attendance, class participation, attentiveness, attitude in class, and cooperation to produce the maximum learning situation for everyone.

The instructor will give you a grade sheet so that you can record your scores and keep track of your progress in the course. There is also a web page that you can use to check your grades throughout the semester. If you are concerned about your grades, see the instructor.

Assignments are due at the beginning of the class period on the date they are due. The instructor may be gracious and allow you to turn them in later that day without counting them late, but do not count on his graciousness. Late assignments lose 20% of their value per class period. The instructor reserves the right to apply this rule to missed exams as well as regular assignments. No late work will be accepted after the final.

Attendance Policy

Regular attendance is essential for satisfactory completion of this course. Mathematics is a cumulative subject and each day builds on the previous day's material. If you have excessive absences, you cannot develop to your fullest potential in the course.

Students who, because of excessive absences, cannot complete the course successfully, are required to be administratively dropped from the class at midterm. If a student stops attending after midterm, it is the student's responsibility to withdraw to avoid an "F". Do not stop attending and assume that you will be withdrawn from the class by the instructor.

Although dropping students for non-attendance at midterm is required, students whose attendance is occasional or sporadic may be dropped from the class at any point during the semester at the instructor's discretion. The safest way to make sure you're not dropped for non-attendance is to continue to attend classes.

The student is responsible for all assignments, changes in assignments, or other verbal information given in the class, whether in attendance or not.

If a student must miss class, a call to the instructor (RCC's phone system has an answering system) should be made or an email message sent. When a test is going to be missed, the student should contact the instructor ahead of time if at all possible. Under certain circumstances, arrangements can be made to take the test before the scheduled time. If circumstances arise where arrangements cannot be made ahead of time, the instructor should be notified and a brief explanation of why given by either voice or email. This notification must occur before the next class period begins. At the instructor's discretion, the score on the final exam may be substituted for the missed exam.

Calculators

A TI-82, TI-83, or TI-84 graphing calculator will be sufficient for this course. That said, a TI-92, TI-89, or TI-Voyage calculator is recommended for this course if you plan on taking additional calculus courses. There are computers in the classroom with Derive on them, and these may be used by students who don't have the TI-92 or TI-89 calculator. Calculators may be used to do homework. Calculators may be used on exams and/or quizzes in class unless otherwise announced.

There are no calculator specific programs that we will be using during this class, so you do not have to have a TI calculator. However, if you have a different (Casio, Sharp, HP) graphing calculator, you will be on your own as far as figuring out how to use it.

Additional Supplies

The student should have a pencil, red pen, ruler, graph paper, stapler, and paper punch. The student is expected to bring calculators and supplies as needed to class. The calculator should be brought daily. There will be a paper punch and stapler in the classroom.

Homework

Homework out of the book is part of your grade. Success in the class is highly related to the amount of homework done. There is a separate sheet detailing the homework assignments. Homework is expected to be completed by the next class period, but is not collected until the end of each chapter.

Technology

In this course, we will concentrate on understanding the concepts of calculus. There will be instances when we will use the calculator or computer to aid in our understanding or remove some of the tediousness of the calculations (especially in the area of numerical approximations). There may be some projects, homework, or portions of a test that require you to use technology to complete.

Here are some of the technology tools that we will use.

Derive

Derive is an computer algebra system that can perform symbolic manipulation of algebraic expressions and equations. We will use Derive primarily as an aide to checking our calculations or when answers get really nasty. For the most part, you will be expected to perform the algebraic manipulations yourself. Richland has a site license for Derive version 6, but that license does not allow you to take a copy home. Texas Instruments has discontinued Derive and replaced it with TI-Nspire.

WinPlot

WinPlot is a free graphing software package for Windows written by Rick Parris at Phillips Exeter Academy in NH. The software is useful for creating graphs and it is easy to copy/paste the graphs into other applications. You may download the software by right-clicking your mouse on the word "WinPlot" at the top of the page http://math.exeter.edu/rparris/winplot.html and choosing save.

Additional Help

The student is encouraged to seek additional help when the material is not comprehended. Mathematics is a cumulative subject; therefore, getting behind is a very difficult situation for the student. There are several places where you can seek additional help in your classes.

Instructor

I try to make myself as available to the students as I can. My office hours are listed at the beginning of this syllabus, but those are just the times I'm scheduled to be in my office. Grab me and ask me questions if you see me in the hallway. Ask questions before or after class. If I'm in my office and it's not my scheduled office hours, go ahead and stop in.

The instructor should be considered the authoritative source for material related to this class. If a tutor or other student says something that disagrees with the instructor, believe the instructor.

Study Groups
Probably the best thing you can do for outside help is to form a study group with other students in your class. Work with those students and hold them accountable. You will understand things much better if you explain it to someone else and study groups will also keep you focused, involved, and current in the course.

Student Learning Center
The Student Learning Center is located in rooms S116, S117, and S118. There is mathematics tutoring available in room S116. The Student Learning Center and the tutoring is a service that Richland Community College offers you free of charge.

Quality tutors for the upper level mathematics are difficult to find. Please consider forming a study group among your classmates.

Learning Accommodation Services
There are accommodations available for students who need extended time on tests, note takers, readers, adaptive computer equipment, braille, enlarged print, accessible seating, sign language interpreters, books on tape, taped classroom lectures, writers, or tutoring. If you need one of these services, then you should see Learning Accommodation Services in room C136. If you request an accommodation, you will be required to provide documentation that you need that accommodation.

Some of you will need additional time on tests. There is no need to go to learning accommodation services to request that. If you need additional time, just let me know and I will probably allow you to continue working past the allotted time. You may need to move to another room as there may be another class coming into your room. If you're unable to finish the test by staying late, it may be possible to start the test earlier to gain additional time.

Academic Dishonesty
Each student is expected to be honest in his/her class work or in the submission of information to the College. Richland regards dishonesty in classroom and laboratories, on assignments and examinations, and the submission of false and misleading information to the College as a serious offense.

A student who cheats, plagiarizes, or furnishes false, misleading information to the College is subject to disciplinary action up to and including failure of a class or suspension/expulsion from the College.

Non-Discrimination Policy
Richland Community College policy prohibits discrimination on the basis of race, color, religion, sex, marital or parental status, national origin or ancestry, age, mental or physical disability (except where it is a bonafide occupational qualification), sexual orientation, military status, status as a disabled or Vietnam-era veteran.

Electronic Communication Devices

The Mathematics and Sciences Division prohibits the use of cell phones, pagers, and other non-learning electronic communication equipment within the classroom. All equipment must be turned off to avoid disturbances to the learning environment. If a student uses these devices during an examination, quiz, or

any graded activity, the instructor reserves the right to issue no credit for these assignments. The instructor needs to approve any exceptions to this policy.

Topical Outline

Hours	Topic

6   **Functions**
- Graphing functions on calculators and computers
- Transformations of functions
- Symmetry
- Extensive review of trigonometry

10   **Limits and Continuity**
- An intuitive approach to limits
- Two sided limits and one sided limits
- Numerical approach to finding limits
- Techniques of computing limits
- Infinite limits
- Rigorous definition of limit
- Continuity
- Limits and continuity of trigonometric functions

14   **Derivatives**
- Slopes and rate of change
- The limit definition of derivative
- Techniques of differentiation
- Derivatives of trigonometric functions
- The chain rule
- Implicit differentiation
- Related rates
- Differentials and local linear approximations

10   **Applications of Differentiation**
- Intervals where increasing, decreasing, constant, concave up, concave down
- Relative extrema and points of inflection
- Sketching functions, using technology
- First and second derivative test
- Absolute extrema
- Applied maximization and minimization problems
- Newton's Method
- Rolle's Theorem and the Mean Value Theorem
- Rectilinear motion

Hours	**Topic**

13   **Integration**
- Overview of the area problem
- Indefinite integrals, slope fields, integral curves
- Integration by substitution
- Sigma notation
- The definite integral as a Riemann sum
- Fundamental theorem of Calculus
- Rectilinear motion
- Definite integrals by substitution

11   **Applications of Definite Integrals**
- The area between two curves
- Volumes of rotation by slicing, disks, washers, and cylindrical shells
- Length of a plane curve
- Surface area of revolution
- Average value
- Work
- Fluid pressure and force